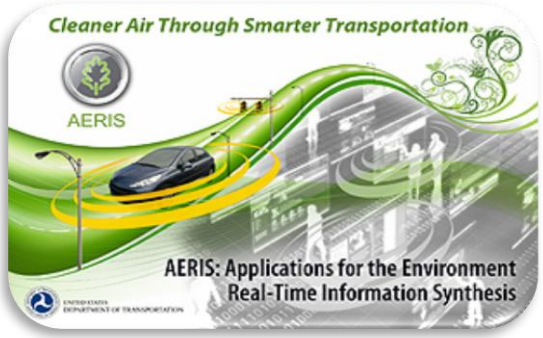
An Evaluation of Likely Environmental Benefits of Lowest Fuel Consumption Route Guidance



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Project Overview

This project developed an integrated simulation modeling framework capable of calculating time-dependent fuel consumption factors for road segments in the Buffalo-Niagara metropolitan area. This was accomplished by linking the Buffalo –Niagara TRANSIMS model to MOVES2010. Output from TRANSIMS (i.e., information about vehicle speeds and accelerations) were used as inputs to MOVES2010 in order to estimate link-specific fuel consumption factors and emission rates.

The modeling framework assigned drivers in TRANSIMS to take the green route and to estimate the likely environmental benefits expected from having motorists follow the lowest fuel consumption route. The research project also assessed the impact of market penetration (i.e., the percentage of drivers utilizing the lowest fuel consumption route) on the likely environmental benefits of the strategy.

The Buffalo-Niagara Metropolitan Area

The evaluation of the likely benefits of environmentally-based route guidance was studied in the Buffalo-Niagara metropolitan area. There are four factors that suggested this metropolitan area to be a good candidate for this research:

- The Buffalo-Niagara metropolitan area was recently selected as one of a handful of sites nationwide for the deployment of the TRANSIMS model.
- The metropolitan area was recently chosen as one of the sites for a SHRP2 naturalistic driving study which involves collecting large-scale naturalistic driving data from a fleet of instrumented vehicles.
- The metropolitan area is relatively rich in data as a result of extensive ITS monitoring capabilities.
- The metropolitan area is the right size for an evaluation – not too big or too complex, nor too small.

Environmentally-Based Routing

This research project conducted a realistic assessment, using a real-world case study of the Buffalo-Niagara area to investigate the potential environmental benefits of providing route guidance to travelers based on the lowest fuel consumption route. Drivers currently choose their route based on minimizing their perceived total travel time or generalized cost. Almost all routing algorithms commonly used within the transportation industry (e.g., user equilibrium (UE) and system optimal assignments) are based on the assumption of drivers selecting the shortest path between a given origin-destination (O-D) pair. Moreover, the basis for routing in most GPS navigation devices is typically based on minimum travel time. Until recently, the transportation profession lacked the necessary tools to determine whether the fastest route between O-D pairs were, in fact, the optimal route from an environmental standpoint. With advances in Intelligent Transportation Systems (ITS), microscopic simulation models, and connected vehicle technology research, the opportunity now exists to further research the feasibility and likely benefits of routing strategies that explicitly consider the criteria of minimum energy consumption and emissions in recommending a route for a driver.